

Chemical Reactions

Chapter 11

Chemical Equations

- **Word equations**

- Write the names of the reactants to the left of the arrow (separated by a + sign) and write the products in a similar manner to the right of the arrow.

- **Chemical Equations**

- Write the formulas of the reactants to the lefts of the yields sign (arrow) and the formulas of the products to the right.

Writing Equations

- Write either the word equation or chemical equation of the following:
 - Solid magnesium reacts with oxygen gas to produce magnesium oxide.
 - $\text{Fe (s)} + \text{O}_2 \text{ (g)} \longrightarrow \text{Fe}_2\text{O}_3 \text{ (s)}$
 - When heated, solid mercury(II) sulfide reacts with oxygen gas to produce liquid mercury and sulfur dioxide gas.
 - $\text{CaCO}_3 \text{ (s)} \xrightarrow{\text{heat}} \text{CaO(s)} + \text{CO}_2 \text{ (g)}$

Balancing Equations

- Use coefficients to balance an equation so it obeys the law of conservation of mass!
- Examples
 1. hydrogen + oxygen \longrightarrow water
 2. zinc + hydrochloric acid \longrightarrow zinc chloride + hydrogen
 3. nitric acid + magnesium hydroxide \longrightarrow magnesium nitrate + water

Double Replacement Reactions

- A reaction in which **ions** in 2 compounds “exchange partners” to form 2 new compounds

- General Formula



- This reaction will occur if...
 - An insoluble product (precipitate) forms
 - Gas is given off
 - Liquid water is formed

Double Replacement Examples

- lead (II) nitrate + potassium iodide \longrightarrow

- iron (II) chloride + potassium sulfide \longrightarrow

- calcium hydroxide + hydrochloric acid \longrightarrow

Double Replacement Examples

- sodium acetate + potassium bromide \longrightarrow
- potassium phosphate + magnesium chloride \longrightarrow
- sodium hydroxide + phosphoric acid \longrightarrow
- potassium sulfate + calcium nitrate \longrightarrow

Net Ionic Equations

- Shows only those particles involved in the reaction.
- Spectator ions or those ions not directly involved in the reaction are left out of these equations.

**Solids (s),
liquids (l)
& gases (g)
don't split!**

**Only
aqueous
(aq)
splits!!**

Net Ionic Equations



Net Ionic Equations



Net Ionic Equations

First complete the reaction (& balance), then write the net ionic equation...

- Silver nitrate + sodium chloride \longrightarrow

Single Replacement Reactions

- A reaction in which 1 element takes the place of another element as part of a compound.
 - **Metals always replace another metal**
 - **Nonmetals always replace another nonmetal (only halogens)**
 - Fluorine is the most reactive, iodine the least reactive!

Single Replacement Examples

- If solid zinc metal is placed in an aqueous solution of copper (II) sulfate will a reaction occur?



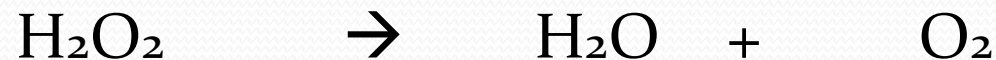
Single Replacement Examples

- If solid silver metal is placed in an aqueous solution of potassium nitrate will a reaction occur?



Decomposition Reactions

- A reaction that occurs when 1 reactant breaks down into 2 or more products.



Specific Decomposition Reactions



Specific Decomposition Reactions

- Acid \rightarrow H₂O + remainder of elements



- $\text{NH}_4\text{OH} \rightarrow \text{NH}_3 + \text{H}_2\text{O}$

Synthesis (Combination) Reactions

- A reaction that occurs when **2 reactants** combine to form **1 product**.



Specific Synthesis Reaction



Where M is any metal!

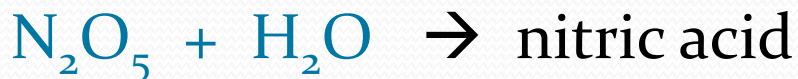


**Opposite of
Decomposition!**

Specific Synthesis Reaction



Where N is any nonmetal!



**Opposite of
Decomposition!**

Combustion Reactions

- A reaction that occurs when a hydrocarbon reacts with O₂ gas to form CO₂ and H₂O.

